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DOCUMENT-IDENTIFIER: US 5882476 A
TITLE: Deinking printed wastepaper using alkaline solution containing sodium sulfite and sodium carbonate

Abstract Text (1):
This invention is a method for deinking wastepaper by disintegrating the waste paper in an carbonate aqueous solution containing sodium sulfite and sodium carbonate to produce a fibrous slurry having a pH of at least 7.5, separating the ink from the fibers and removing the ink from the slurry. A composition useful for deinking fiber consists of a relative proportion of sodium sulfite to sodium carbonate between about 95:5 and about 50:50, and a surfactant.

Brief Summary Text (2):
The invention relates to a method for deinking printed wastepaper, and the use of a deinking agent, to produce a recycled pulp that can be processed into paper products.

Brief Summary Text (4):
In a conventional wastepaper reclamation process, deinking methods include disintegrating the wastepaper, or "furnish", into a pulp or slurry in an aqueous alkaline deinking solution containing deinking agents, washing and then bleaching the pulp. Physical agitation of the paper fibers causes some ink separation. Caustic soda is usually used to provide the alkalinity needed to promote fiber swelling that results in the remaining ink to separate from the paper fibers. Surfactant is added to prevent the ink from reattaching to the fibers. The surfactant also acts as a foaming agent to carry off the ink when the fibers are washed in flotation cells. Hydrogen peroxide or other bleaching agents are added to whiten and brighten the pulp to the appropriate end-use requirements. Metal silicates are added to stabilize the bleaching agents.

Brief Summary Text (5):
The caustic soda and bleaching agents can have deleterious effects on the paper fibers. At the high pH levels needed for caustic soda to promote ink-fiber separation, the strong alkalinity can embrittle the fibers and cause alkaline darkening. Although the bleaching agents counteract the darkening, these agents can further weaken the fibers.

Brief Summary Text (8):
The present invention provides a method of deinking recycled fibers by disintegrating waste paper in an alkaline aqueous solution containing sodium sulfite and sodium carbonate to produce a fibrous slurry having a Ph of at least about 7.5, separating ink from the fibers and removing the ink from the slurry. This process advantageously provides the alkalinity needed to separate the ink without embrittling or darkening the fibers.

Brief Summary Text (9):
In another embodiment, there is provided a composition used to promote ink-fiber separation consisting of sodium sulfite and sodium carbonate in a ratio between about 95:5 and 50:50, and a surfactant. The use of this invention may produce recycled pulp of desired brightness so that additional bleaching is eliminated completely or greatly reduced. Further advantages and benefits will be apparent from the detailed description of the invention.

Brief Summary Text (11):
The present invention includes a wastepaper deinking process in which the wastepaper charge is disintegrated in an alkaline aqueous solution containing sodium sulfite and sodium carbonate, and preferably, surfactant, to produce a fibrous slurry. These chemicals separate the ink from the wastepaper fibers and keep the ink from reattaching to the fibers. The slurry is then washed by screen washing, or flotation, to remove the ink from the slurry. The pulp in the slurry has good properties, such as freeness and brightness, so that it can then be pressed into a paper or used as a raw material for the other high quality paper products.

Brief Summary Text (12):
The invention is applicable to the deinking of common wastepaper stocks, such as newsprint, book, ledger, magazine, xerographic paper and mixed office waste. The wastepaper charge to the process is also known as the "furnish". The chemical requirements of the process can vary depending on the furnish. As different papers are made from different processes, such as the acid-sulfite process, the kraft process, the groundwood process, the chemithermomechanical process, etc., the wastepaper furnish exhibits different characteristics depending on the combination of papers used to make up the furnish.

Brief Summary Text (14):
The process, according to this invention, is carried out by placing the furnish in a disintegrator with water and the deinking agent. The disintegrator physically reduces the furnish into individual fibers. This step can be accomplished using any of the various conventional equipment designed for this purpose. For example, either a disintegrator or a hydrapulper may be used. This equipment reduces the furnish and contents into a pulp or a fibrous slurry. It is preferred that the furnish be disintegrated in an alkaline environment so that the deinking agents and mechanical stress cooperate to most effectively separate the ink from the fibers. However, it is possible to carry out the invention by first producing a slurry and then adding the deinking chemicals.

Brief Summary Text (15):
Depending upon the furnish used and the slurry product requirements, sufficient sodium sulfite and sodium carbonate should be used to achieve a pH in the slurry between about 7.5 and 10.5. It is believed that the pH of the slurry after the furnish has been disintegrated is important to control. Therefore, an acidic furnish will require more sodium sulfite and sodium carbonate to obtain the desired end pH, then will an alkaline furnish. Preferably, sufficient deinking agent is used to achieve a slurry pH between about 8 and about 10, more preferably, between about 9 and about 10.

Brief Summary Text (16):
Typically, the invention will require sodium sulfite and sodium carbonate in a total quantity between about 0.5 percent by weight and about 12 percent by weight, calculated as a percent of the dry weight of the furnish. For example, in deinking waste newsprint sourced from the southeast United States, by adding a total quantity of sodium sulfite and sodium carbonate between about 1% and about 7.5% by weight of dry furnish, a pH between about 9 and about 10 can be achieved in a slurry with a 3% consistency. The proportion of sodium sulfite is preferably about 70% to about 30% sodium carbonate for this example. Thus, between about 0.7% and about 5.0% sodium sulfite and between about 0.3% and about 2.5% sodium carbonate may be used. Preferably, between about 2.1% and about 5.0% sodium sulfite and between about 0.9% and about 2.5% sodium carbonate is used. A pH of about 9.5 may be achieved by using about 3.5% sodium sulfite and about 1.5% sodium carbonate by weight of dry furnish in a slurry with 3% consistency.

Brief Summary Text (18):
The optimal pH and optimal amount of sodium sulfite and sodium carbonate will vary depending on the consistency of the slurry. Generally, it is believed that the desirable slurry pH will decrease with higher consistencies. As well, because the sodium sulfite and sodium carbonate are measured on the basis of the dry weight of the furnish, lower amounts on this basis will be needed to obtain the same aqueous concentrations with higher consistency slurries. Correspondingly, lower amounts of sodium sulfite and sodium carbonate, on the basis of the dry weight of the furnish, will be needed to obtain the same or lower pH with higher consistency slurries. Even though there is likely no direct linear correlation, a person having ordinary skill in the art may readily determine the optimal pH and amount of deinking agent required from the foregoing without undue experimentation.

Brief Summary Text (19):
The invention may be carried out using a composition for wastepaper deinking that includes relative proportions of between about 50-95% sodium sulfite and about 5-50% sodium carbonate. Also, the deinking agent may include up to an equal amount of surfactant. Preferably, the deinking composition contains relative proportions of between about 60-80% sodium sulfite, and between about 20-40% sodium carbonate. More preferably, the deinking composition contains relative proportions of about 70% sodium sulfite and about 30% sodium carbonate. Preferably, surfactant may be added in a ratio to the combined sodium sulfite and sodium carbonate between about 1:1 and about 1:1000. More preferably, the relative ratio of surfactant may be on the order of magnitude

between about 1:10 and about 1:100.

Detailed Description Text (2):
A furnish was made up of 100% waste newsprint sourced from the southeast United States. The furnish was disintegrated in a Standard British Disintegrator using 33 air-dried grams of newsprint in 1 liter of tap water at about 55.degree. C. Sodium sulfite and/or sodium carbonate was added to the Disintegrator in the amounts as shown in Table 1 calculated as a percent of the dry wastepaper charge. Sodium hydroxide was used as a benchmark control. The Disintegrator was then run for 15 minutes. The pH of the resulting slurry was measured at the end of the disintegration run. The temperature, generally, decreased to about 40.degree. C. at the end of the disintegration run.

Detailed Description Text (5):
As the data show, the use of sodium sulfite alone showed some slight improvement in brightness over the control. However, the brightness increased significantly when the sodium sulfite was used in combination with sodium carbonate. The optimum brightness was achieved in Example 8 with the addition of 3.5% sodium sulfite and 1.5% sodium carbonate.

CLAIMS:

1. A method of deinking printed wastepaper fibers comprising the steps of:

disintegrating the wastepaper in an alkaline aqueous solution containing sodium sulfite and sodium carbonate with no other bleaching agents and no caustic alkalis added to form a fibrous slurry having a pH of at least about 7.5;

separating the ink from the paper fibers in the slurry; and

removing the separated ink from the slurry.

2. The method of claim 1 wherein the sodium sulfite and sodium carbonate are in a ratio between about 95 to 5 and about 50 to 50 by weight with respect to each other.

3. The method of claim 2 wherein the sodium sulfite and sodium carbonate are in a ratio between about 80 to 20 and about 60 to 40 by weight with respect to each other.

4. The method of claim 1 wherein at least about 0.7% by weight of dry paper charge of sodium sulfite and at least about 0.3% by weight of dry paper charge of sodium carbonate are added to the wastepaper.

5. The method of claim 4 wherein less than about 5% by weight of dry paper charge of sodium sulfite is added and less than about 2.5% by weight of dry paper charge of sodium carbonate is added.

6. The method of claim 5 wherein at least about 2% sodium sulfite and at least about 0.8% sodium carbonate is added.

7. The method of claim 6 wherein sodium sulfite is about 3.5 weight percent and sodium carbonate is about 1.5 weight percent.

13. The method of claim 1 wherein sodium sulfite and sodium carbonate are added prior to disintegrating the wastepaper.

14. The method of claim 1 wherein the sodium sulfite and sodium carbonate are added with no other alkalis or deinking agents.

15. A method for deinking printed wastepaper comprising disintegrating the newsprint in an alkaline aqueous solution containing between about 0.7% and about 5% by weight of paper charge of sodium sulfite and between about 0.3% and about 2.5% by weight of paper charge of sodium carbonate with no other bleaching agents and no caustic alkalis added, to produce a slurry having a pH between about 7.5 and about 10.5, separating the ink from the paper fibers in the slurry and removing the separated ink from the slurry.